HITACHI

Instruction Manual

VL-21A

Table of Contents

1. Document History

Revision	Issue Date	Reason	CN#
Rev A	07-21-11	Initial Release	11-00

2. Specifications

Signal System	NTSC	
Scanning System	2 : 1 Interlace	
Scanning Frequency (H)	15.734KHz	
Scanning Frequency (V)	59.94Hz	
Image Sensor	1/4" IT CCD	
Total Pixels	811 (H) x 508 (V)	410K
Effective Pixels	768 (H) x 494 (V)	380K

2.1 Lens

F1.6 (W) ~ 3.7 (T) (± 7%), f = 3.6 ~ 97.2mm (± 7%)
x27 Zoom Video Auto Focus
High Durability Zoom Lens

Zoom Durability	More than 500K at Room Temperature
Focus Durability	More than 1,000K at Room Temperature
Iris Durability	More than 500K at Room Temperature
Focus Length	∞ ~1.0m (Tele) ~ 0.01m (Wide)
Signal Process	Digital Signal Processing
Sync System	Internal / External

Camera Functions

Optical Zoom	TELE ~ WIDE (Zoom Speed: 4 sec)
Digital Zoom	Off / On (x 10 times)
Video Focus	Auto / Manual (NEAR ~FAR) / Push Auto Manual Mode Zoom Start → Zoom Stop Manual → Manual (AF Action is activated for a moment before focus stops)
White Balance	**AUTO** / Indoor / Outdoor / Push Auto / Manual (R&B Gain Level UP/DOWN) Special (R or B Gain Level Control)
Shutter Speed	AUTO / Manual (1/60 ~ 1/10000 (NTSC)
Iris Control	AUTO / Manual (Manual Iris Level: UP ~ Down
Gain Control	AUTO / Manual (Manual Iris Level: UP ~ Down

Sharpness	**Manual** (Sharpness UP ~ Down)
Brightness	**Manual** (Brightness UP ~ Down)
Negative	**Off** / On
OSD Function	**On** / Off, English / Chinese (Appendix 1)
Flickerless	**Off** / On 1/100 sec Shutter Set NTSC
Back Light	**Normal** / Zone Selectable
Day & Night Function	**Auto** / Day / Night
Video Output Levels	Video Level = 0.714 ± 0.07v (100 ± 10 IRE) Sync Level = 0.286 ± 0.035v (40 ± 10 IRE) Burst Level = 0.286 ± 0.035v (40 ± 10 IRE)

Color Reproduction

Color	**Red**	**Blue**	**Yellow**	**Burst**
Amplitude (%)	200 ± 40%	130 ±40%	115 ± 40%	100% Base
Phase (°)	103 ± 20°	345 ± 20°	170 ± 20°	180 ± 20°

Horizontal Resolution	More than 580 TV Lines (High Resolution)
Luminance S/N	More than 50db
Sensitivity Typ.	1 lux at signal level 30 IRE (Lens—F: F=1.6 (WIDE) AGC Gain: Max) **Day Mode**: 1.2 lux, **Night Mode**: 0.25 lux, **Digital Slow Shutter:** 0.00005 lux
Supplied Voltage	11.5 v ~ 15.0 v DC (recommended 12.0 ± 0.5v) Camera will not turn on below 11.5 v DC
Supplied Current	240 ma (steady state)
Power Consumption	4.56 watts
Dimensions	48.0mm (W) x 51.5mm (H) x 81.6mm (D)
Weight	205g (approximate)
Appearance / Dimensions	See Section 7
Body Color	Black

3. Measurement Specifications

See “Appendix 2” for Standard Measurement Condition and Measurement Procedure

4. Environment Condition and Test

Operating Condition	Temperature	-10°C ~ 60°C
		(Recommendation: -5°C ~ 50°C)
	Humidity	20% ~ 60%
Storage Condition	Temperature	-40°C ~ 60°C
	Humidity	0% ~ 90%

4.1 High Temperature Storage Test

In Storage condition at a temperature of 60°C for 72 hours, t hen leaving it at Normal Temperature for 8 hours, there will be no problem in performance.

4.2 Low Temperature Storage Test

In Storage condition at a temperature of -40°C for 72 hours, then leaving it at Normal Temperature for 8 hours, there will be no problem in performance.

5. Interface

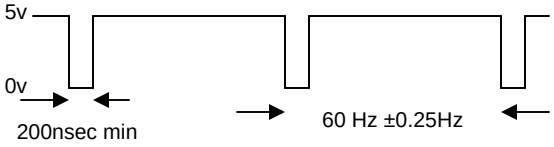
5.1 Pin Assignment

TTL Communication (10 Pin FFC Connector; Maker LinkWork 1.0mm Pitch, Upper Contact)

5.2 J204 - 10 Pin Connector

Pin	Name	I / O	Level
1	C Out	Output	Chroma Out
2	Y Out	Output	Luminance Out
3	Gnd		Video Ground
4	V Out	Output	Composite Video Output
5	12 V	Input	11.5 to 12.5 volts DC
6	Key 1	Input	
7	Key 2	Input	
8	RXD	Output	CMOS Level 5v (low: ≤ 0.8v, High: ≥ 3.7v
9	TXD	Input	CMOS Level 5v (low: ≤ 0.8v, High: ≥ 3.7v
10	Gnd		Power / Data Ground

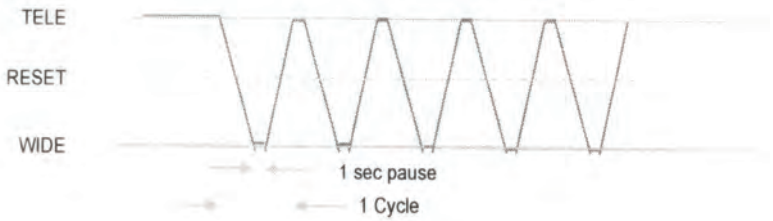
5.3 Line In Pulse (Ex, FV)



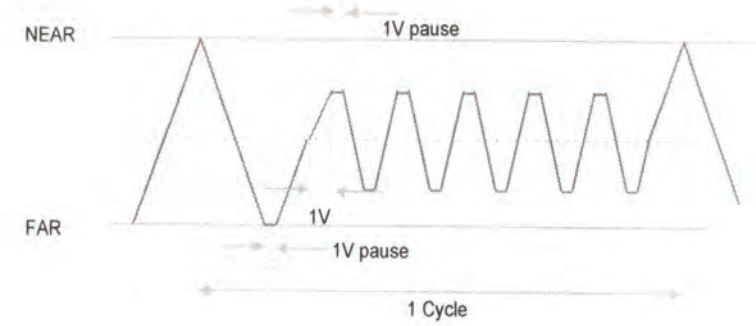
* The 10 pin Connector (JAE) over the camera module is used for manufacturing. (Not for user)

6. Lens Test Condition

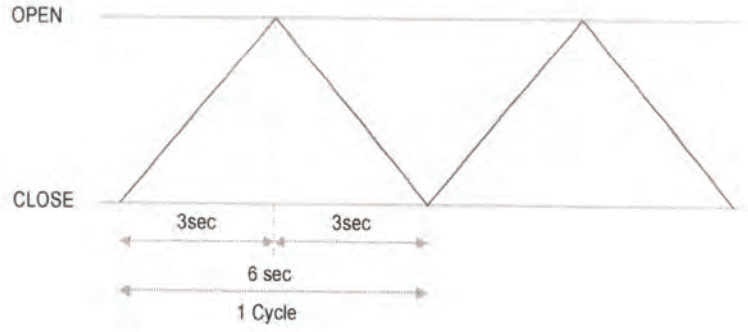
6.1. Zoom



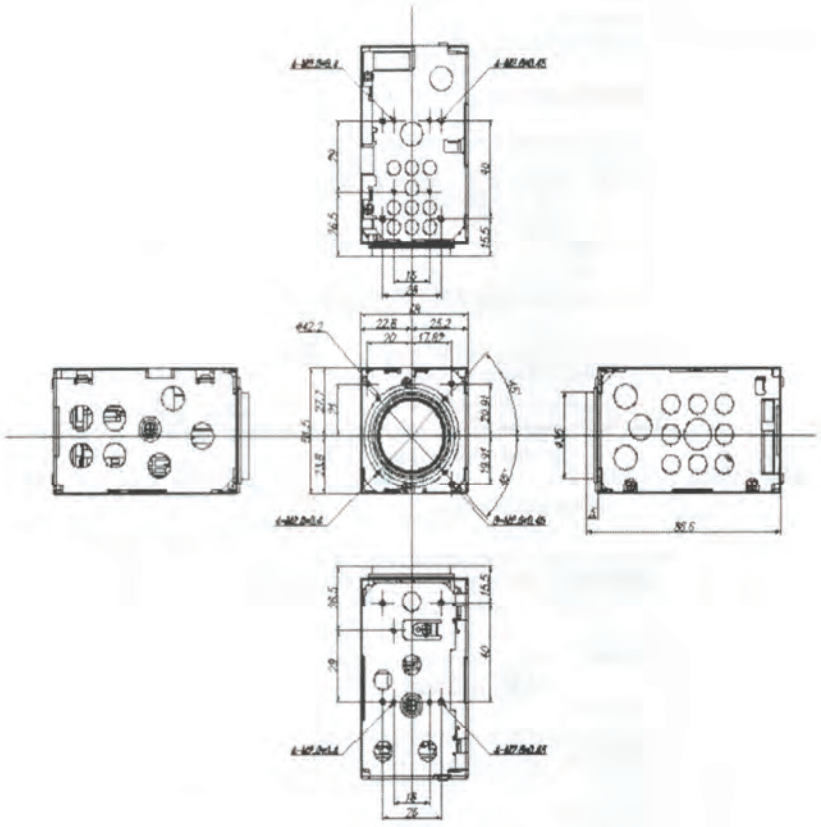
6.2. Focus



6.3. Auto Iris



7. Appearance

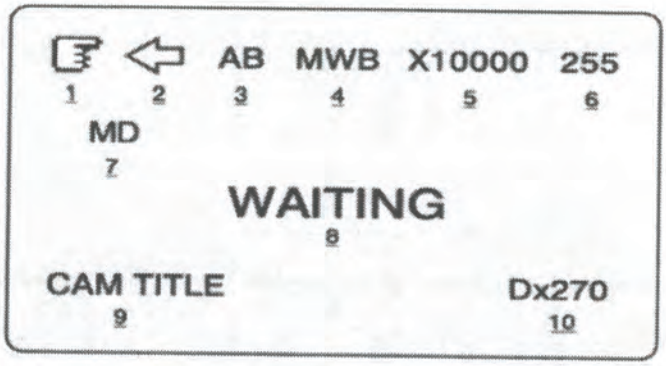


8. Appendix 1

8.1 OSD (On Screen Display)

1) OSD Display Position

The OSD (On Screen Display) is as follows:



2) Description

"ND": No Display

	FUNCTION	OSD	EXPLANATION
1	Focus	ND	Automatic focus mode
		☞	Manual focus mode
2	D-Effect	ND	No screen inverted
		⇦	Screen is inverted to the horizontality or verticality.
3	Backlight	ND	Backlight compensation off
		AB	Automatic backlight compensation mode

The OSDs of ***1, 2, 3, 4, 5, 7, 8, 10*** disappear 5 sec later.

"ND": No Display

	FUNCTION	OSD	EXPLANATION
4	White Balance	ND	Automatic color correction mode
		MWB	Special color correction mode
		IWB	Indoor mode
		OWB	Outdoor mode
		PWB	Temporary automatic mode
5	Shutter Speed	ND	Standard shutter speed (NTSC:1/60, PAL:1/50)
		FLK	Flicker correction mode
		x125 ~ x10000	Shutter speed indicator
6	ID	000 ~ 255	Camera identification number
7	Motion Detect	ND	No motion detected
		MD	Motion detected
8	Initial LOGO	WAITING	Displayed when POWER ON of the camera is in operation
9	Cam Title	-	Explanation of the scene capture by the camera (max. 10 letters)
10	Zoom	x1 ... Dx270	Optical zoom: x1 ~ x27 Digital zoom: Dx28 ~ Dx270 * 'D' indicates digital zoom

* The OSDs of ***1, 2, 3, 4, 5, 6, 8, 9, 11*** disappear 5 sec later.

8.2. Menus and Operations

8.2.1. MAIN MENU

- The main menu is shown below. 9 functions can be selected. Many of these sections have subsections as described in the proceeding pages.
- Each section has INITIAL and EXIT.
    - INITIAL: Resets the function back to the factory default setting for that particular category
    - EXIT: Closes the menu or submenu and moves you back to the main menu.

MENU
FOCUS
EXPOSURE
BLC
WHITE BAL
3D-DNR
SPECIAL
GENERAL
INITIAL
EXIT

8.2.2. FOCUS

- Sets camera zoom and focus

FOCUS

FOCUS MODE	MANUAL
FOCAL DIST	50CM
ZOOM START	X001
ZOOM END	X270
ZOOM SPEED	3
REFRESH MODE	OFF
REFRESH TIME	NOT USED
INITIAL	ON
EXIT	

FOCUS MODE

- AUTO; Focuses automatically
- MANUAL*: Focuses manually via end user.

*Note: Automatic focus in manual mode is only possible when the location of the zoom lens has changed or when the “temporary automatic focus” category is selected. Automatic focus is also possible based on external AF command.

FOCAL DIST

- Minimal distance the camera can focus. EX: 10cm: Objects closer than 10 cm cannot be brought into focus.

ZOOM START

- Minimum zoom movement. Possible from x 001 to x 270.

ZOOM END

- Maximum zoom movement. Possible from x001 to x270.

ZOOM SPEED

- Zoom speed movement. Possible from x1 to x27

MENU

FOCUS
EXPOSURE
BLC
WHITE BAL
3D-DNR
SPECIAL
GENERAL
INITIAL
EXIT ←

8.2.3. EXPOSURE

	EXPOSURE
AE MODE	AUTO
SHUTTER	NOT USED
IRIS	NOT USED
AGC	NOT USED
BRIGHTNESS	25
FLICKERLESS	OFF
D.S.S.	FLD 4
INITIAL	ON
EXIT	←

AE MODE

- AUTO, MANUAL

BRIGHTNESS

- Can be adjusted from 0 (dark) to 48 (bright). Note: Not used while in manual mode.

FLICKERLESS

- Removes screen flickering caused by discordance of frequency and lighting.

D.S.S.

- Use under very low light conditions for full color surveillance.
- OFF< FLD 2 FLD 128

8.2.4. BLC

- Use to select BLC mode.

MENU	
FOCUS	
EXPOSURE	
BLC	NORMAL, R2, R1, D2, D1, U2, U1
WHITE BAL	
3D-DNR	
SPECIAL	
GENERAL	
INITIAL	
EXIT	←

8.2.5. WHITE BAL

- Adjusts picture color

MENU	
FOCUS	
EXPOSURE	
BLC	
WHITE BAL	ATW, PUSH, OUTDOOR, INDOOR MANUAL (Red, BLUE, EXIT)
3D-DNR	
SPECIAL	
GENERAL	
INITIAL	
EXIT	←

ATW

- Auto Trace White Balance

PUSH

- Can be used in Temporary Automatic Mode only. Color will automatically be adjusted (the word “pressed” will be displayed).

RED

- Adjusts R-Gain value from 0 - 255

BLUE

- Adjust B-Gain value from 0 - 255

8.2.6. 3D-DNR

- 3D digital noise reduction used to reduce grainy image

MENU	
FOCUS	
EXPOSURE	
BLC	
WHITE BAL	
3D-DNR	OFF, HIGH, MIDDLE LOW
SPECIAL	
GENERAL	
INITIAL	
EXIT	←

MENU	
FOCUS	
EXPOSURE	
BLC	
WHITE BAL	
3D-DNR	
SPECIAL	
GENERAL	
INITIAL	
EXIT	←

8.2.7. SPECIAL

- Special settings to fine tune your camera.

SPECIAL	
D-EFFECT	OFF
SHARPNESS	6
FREEZE	OFF
COLOR	ON
MOTION	
PRIVACY	
INITIAL	←
EXIT	←

8.2.7.1. MOTION

- When there is movement of the subject on the screen there will be an alarm, or the user will be informed through communications on “MD” will display on the screen.
    - NOTE: There is a signal every time there is movement by the subject. If motion is detected, MD (Motion Detector) is displayed on the upper left of the screen.
- Caution: An error can occur in the motion detection function in the following cases:
    - When lighting is unsteady
    - When light changes often even though there is no movement of the subject.

Note: It is recommended that this function should be used after setting the detection sensitivity and the zone state after videoing the environment for an extended time.

MOTION

ZONE SELECT	CENTER
ZONE STATE	OFF
SENSITIVITY	8
INITIAL	OFF
EXIT	←

ZONE SELECT

- Zone can be set to UPPER, RIGHT, CENTER, or WHOLE detection field as shown.

	UPPER	
LEFT	CENTER	RIGHT
	LOWER	

SENSITIVITY

- Sets sensitivity to detect movement from 1 (low) to 15 (high).

MENU

FOCUS
EXPOSURE
BLC
WHITE BAL
3D-DNR
SPECIAL
GENERAL
INITIAL
EXIT ←

8.2.8. GENERAL

- General camera settings.

GENERAL

CAM ID	
ID DISPLAY	OFF
CAM TITLE	OFF
LANGUAGE	ENG
PROTOCOL	DEF
BAUDRATE	9600
VERSION	VER 1.1N
INITIAL	OFF
EXIT	←

CAM ID

- Displays the camera's ID from 0 - 255.

LANGUAGE

- Displays the currently set language.

PROTOCOL

- DEFAULT, P/D (Pelco D) P/P (Pelco P)

8.3. Specifications

Signal System	NTSC
Scanning System	2 : 1 Interlace
Horizontal Scan Frequency	15.734 KHz
Vertical Scan Frequency	59.94 Hz
Image Sensor	1/4 Inch Micro Lens IT CCD
Total Pixels	811 (H) x 508 (V) 410K
Effective Pixels	768 (H) x 494 (V) 380K
Horizontal Resolution	580 TV Lines (BW 600 TV Lines), Sharpness Max.
S/N Ratio	More than 50db (AGC off)
Lens	27x Zoom Video AF (f1.6 (W), f3.7 (T) f = 3.6 ~ 97.2mm)
Angle of View (HOR)	55.21° ~ 2.12°
Minimum Illumination	Day Mode: 0.5 lux (30 IRE) / Night Mode: 0.1 lux (30 IRE) / DSS (128 FLD) Mode: 0.0005 lux (30 IRE)
Synchronization	Internal
Signal Output	1 V p-p Composite Output with 75Ω Terminated
Power Consumption	12 V DC, 0.5 amps / Max 6 watts
Dimensions (W x H x D)	65 x 62 x 122
Weight	Approx 325 grams

8.4. Communication Protocol

■ PELCO "D" Byte Format

-RS-485, 9600bps, 1 Start bit, 8 data bits, 1 stop bit, no parity

■ Command Message

Function	Zoom Tele						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x00	0x20	0x00	0x00	Checksum
Function	Zoom Wide						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x00	0x40	0x00	0x00	Checksum
Function	Focus Near						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x01	0x00	0x00	0x00	Checksum
Function	Focus Far						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x00	0x80	0x00	0x00	Checksum
Function	Menu On / Off						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x40	0x00	0x00	0x00	Checksum
Function	Power On						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x88	0x00	0x00	0x00	Checksum
Function	Power Off						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x08	0x00	0x00	0x00	Checksum
Function	Pelco D Stop						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x00	0x00	Don't care		Checksum

• Pelco Keyboard (95+ PATTERN)

Function	Menu On / Off						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x00	0x23	0x00	0x5F	Checksum

• V/D Keyboard (Set Preset + 98)

Function	Menu On / Off						
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MSG	0xFF	CamID	0x00	0x03	0x00	0x62	Checksum

■ PELCO "P" Byte Format

-RS-485, 9600bps, 1 Start bit, 8 data bits, 1 stop bit, no parity

■ Command Message

Function	Zoom Tele							
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7	BYTE 8
MSG	0xA0	CamID	0x00	0x20	0x00	0x00	0xAF	Checksum
Function	Zoom Wide							
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7	BYTE 8
MSG	0xA0	CamID	0x00	0x40	0x00	0x00	0xAF	Checksum
Function	Focus Near							
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7	BYTE 8
MSG	0xA0	CamID	0x02	0x00	0x00	0x00	0xAF	Checksum
Function	Focus Far							
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7	BYTE 8
MSG	0xA0	CamID	0x01	0x00	0x00	0x00	0xAF	Checksum
Function	Menu On / Off							
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7	BYTE 8
MSG	0xA0	CamID	0x80	0x00	0x00	0x00	0xAF	Checksum
Function	Power On							
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7	BYTE 8
MSG	0xA0	CamID	0x50	0x00	0x00	0x00	0xAF	Checksum
Function	Power Off							
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7	BYTE 8
MSG	0xA0	CamID	0x40	0x00	0x00	0x00	0xAF	Checksum
Function	Continuous Key Stop							
	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 1	BYTE 8
MSG	0xA0	CamID	0x00	0x00	Don't care		0xAF	Checksum

9. Appendix 2

9.1 Measurement Conditions

Standard Measurement Conditions

Supplied Voltage	DC 12 volts ± 0.5 volts
Ambient Temperature	23° C
Humidity	60% RH
Measurement Fixture	Video Output, DC input, RS-232C level Convert (5Vp-p -> 12Vp-p)
Power Supply	12 volts ± 0.5 volts
Color Monitor	CMM20 - 11, Shibasoku or Equivalent
Monochrome Monitor	More than 800 TV Lines of Resolution
Waveform / Vector Scope	1720A, Tektronix or Equivalent
S/N (Signal to Noise) Meter	VN31AX, Shibasoku or Equivalent
Illumination Meter / Color Temperature Meter	XY - 1 / CL - 100, Minolta Camera or Equivalent
Light Box	Dai Nippon Printing Co. -Color Temperature 3200° K ± 100° K -Illumination More than 2000 lux
Test Charts	(Transparent Chart) Color Bar Chart, Dai Nippon Printing Co. Gray Scale Chart, Dai Nippon Printing Co. (Gamma 0.45) Resolution Chart, Dai Nippon Printing Co. (Reflective Chart) Gray Scale Chart, Murakami Color Research Lab
Light Source	Halogen Lamp (with Dimmer Switch) Color Temperature 3200° K ± 100° K Illumination Variable with Dimmer
Color Temperature Filter	LB 140, Hoya or Kenko or Equivalent (Color Temperature Conversion Filter)
Adjustment PC	With Serial Port 1 or 2
RS-232C Cable	Each Terminal Connector (D-Sub 9 pin)

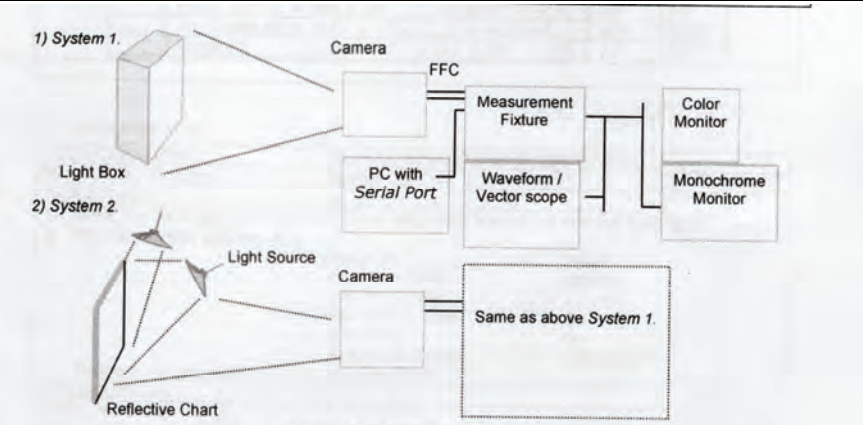


Figure 1. Measuring System

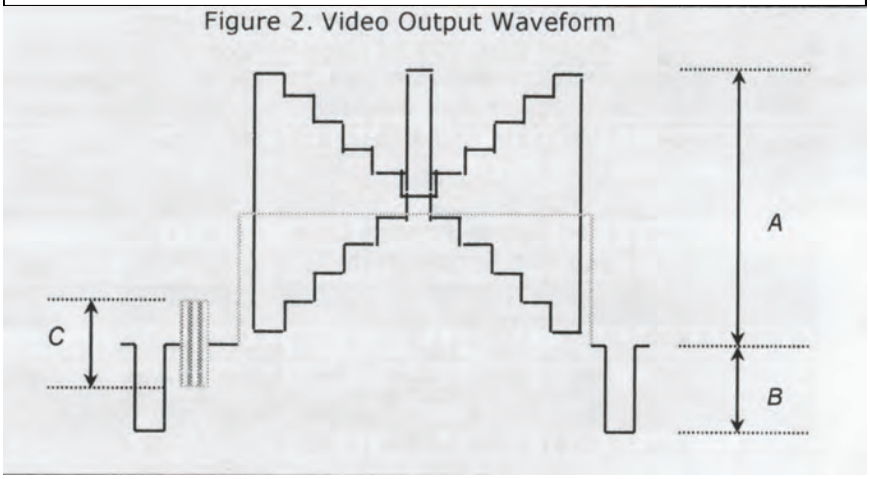
9.2. Measurement Procedure

9.2.1. Video Output Level

TEST CONDITIONS	Refer to “MEASUREMENT CONDITIONS”
MEASURING SYSTEM	System 1
PROCEDURE	

1. Shoot the gray scale chart, and zoom WIDE or TELE to fit the chart to the monitor
2. Measure the video output level on the waveform monitor
   (Before the above measurement, Measure the SYNC and BURST levels)

Figure 2. Video Output Waveform



SPECIFICATION:

Video Level A	100 ± 10 IRE
Sync Level B	40 ± 5 IRE
Burst Level C	40 ± 5 IRE

9.2.2. Color Reproduction

TEST CONDITIONS	Refer to “Measurement Conditions”
MEASURING SYSTEM	System 1
PROCEDURE:	

1. Shoot the color bar chart and zoom WIDE or TELE to fit the chart to the monitor.
2. Measure the color amplitude and color phase on the vector scope of Red, Blue, and Yellow.
   (Before the above measurement, Adjust the burst amplitude and phase on the vectorscope so that the burst level becomes 100% and its phase becomes 180°.

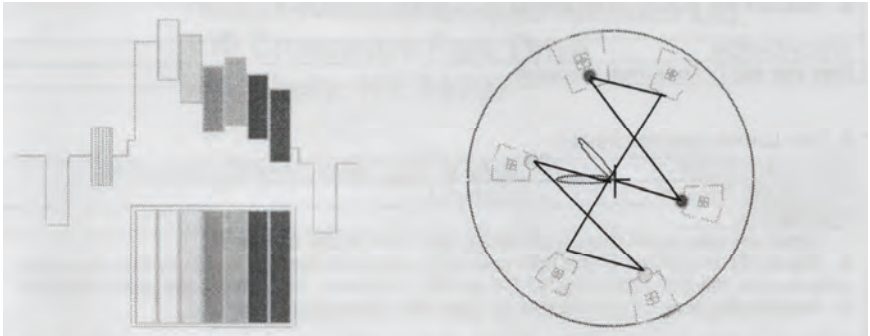


Figure 3. Video Output Waveform

Figure 4. Video Output Color Vector

SPECIFICATION:

COLOR	RED	BLUE	YELLOW	BURST
Amplitude (%)	150 ±40%	100 ±40%	125 ±40%	100%
Phase (°)	98 ± 20°	348 ± 20°	182 ± 20°	180°

9.2.3. Luminance S/N

TEST CONDITIONS	Refer to “Measurement Conditions”
MEASURING SYSTEM	System 1
PROCEDURE:	

1. Shoot the light box and zoom WIDE or TELE to fit the chart to the monitor.
2. The noise meter settings are:

Input Level	:	Preset
High Pass Filter	;	100KHz
Low Pass Filter	:	4.2MHz
Sub-carrier Trap	:	On
Weighting	:	On
Sag & Hue Comp.	:	Optimum

3. Measure the maximum S/N on the noise meter.

SPECIFICATION: More than 50 db (NTSC)

9.2.4. Horizontal Resolution

TEST CONDITIONS	Refer to “Measurement Conditions”
MEASURING SYSTEM	System 1
PROCEDURE:	

1. Shoot the resolution chart and zoom WIDE or TELE to fit the chart to the monitor.
2. Adjust the brightness and contrast of the B/W monitor so that each step of the gray scale portion of the chart can be observed.
3. Change the scan size of the monitor to under scan.
4. The reference arrows on the resolution chart are positioned at the edge of the under scanned picture.
5. Change the scan size of the monitor from under scan to over scan.
6. Measure the maximum horizontal resolution on the picture.

SPECIFICATION:
More than 480 TV Lines (High Resolution)

9.2.5. Low Luminance Sensitivity

TEST CONDITIONS	Refer to “Measurement Conditions”
MEASURING SYSTEM	System 1
PROCEDURE:	

1. Shoot the gray scale chart and zoom WIDE or TELE to fit the chart to the monitor.
2. Adjust the brightness of the light source by using the dimmer switch so that the white peak level of the chart becomes 30 IRE on the waveform monitor.
2. Measure the level of illumination by using the illumination meter.

SPECIFICATION:

10. Contact Information

For technical assistance with this product, please contact the supplier from whom the product was purchased.

Distributed by:

Hitachi Kokusai Electric America Ltd.

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150 Crossways Park Drive

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